

Docket No. SA-537

Exhibit No. 14-B

NATIONAL TRANSPORTATION SAFETY BOARD

Washington, D.C.

Human Performance

Excerpt from B777 Flight Crew Operating Manual Describing
B777 Autothrottle System

(3)



Autothrottle System

The autothrottle system provides thrust control from takeoff through landing.

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Autothrottle operation is controlled from the MCP and the CDUs. The MCP provides mode and speed selection. The CDU allows FMC reference thrust limit selection. When a pitch mode is active, the FMC selects the autothrottle modes and target thrust values. Refer to Chapter 11, Flight Management, Navigation, for FMS and CDU operation.

The autothrottle can be operated without using the flight director or the autopilot. In this condition, the autothrottle operates in either the THR REF, SPD, HOLD or IDLE modes.

When the autothrottle is used during a manual landing, thrust reduces to IDLE at 25 feet radio altitude when the flight director is off or the pitch mode is V/S, FPA, G/S, or any VNAV mode (VNAV SPD, VNAV PTH, or VNAV ALT). The autothrottle does not automatically retard if the pitch mode is TO/GA.

With the autothrottle armed, the autothrottle automatically activates if no autopilot or F/D is active or an autopilot or F/D is in VNAV XXX, ALT, V/S, or G/S, and:

- speed less than an FMC calculated value for one second
- thrust below reference thrust
- airplane altitude above 100 feet RA on approach, or airplane barometric altitude 400 feet above airport on takeoff

The autothrottle can support stall protection when armed and not activated. If speed decreases to near stick shaker activation, the autothrottle automatically activates in the appropriate mode (SPD or THR REF) and advances thrust to maintain minimum maneuvering speed (approximately the top of the amber band) or the speed set in the mode control speed window, whichever is greater. The EICAS message AIRSPEED LOW displays.

Note: When the pitch mode is FLCH or TOGA, or the airplane is below 400 feet above the airport on takeoff, or below 100 feet radio altitude on approach, the autothrottle will not automatically activate.

Refer to Chapter 10, Flight Instruments, Displays, for PFD indications.

Note: During a descent in VNAV SPD, the autothrottle may activate in HOLD mode and will not support stall protection.

The EICAS advisory message AUTOTHROTTLE L or R displays when the respective autothrottle servo fails. If the autothrottle is active and only one autothrottle is armed, the PFD autothrottle flight mode annunciation displays L or R preceding the mode. For example, L SPD indicates only the left autothrottle is active in speed mode.

Autothrottle Thrust Lever Operation

The autothrottle system moves either or both thrust levers to provide speed or thrust control, depending on the active mode.



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Thrust levers can be manually positioned without disconnecting the autothrottle. After manual positioning, the autothrottle system repositions thrust levers to comply with the active mode. The autothrottle system does not reposition thrust levers while in HOLD mode.

Autothrottle Disconnect

The autothrottle system can be disconnected manually by pushing either autothrottle disconnect switch, except during conditions that cause the autothrottle to automatically activate. The autothrottle can also be disconnected manually by positioning both A/T ARM switches to OFF, or individually by positioning the left or right A/T ARM switch to OFF. Positioning one or both A/T ARM switches to OFF prevents activation of all autothrottle modes for the affected autothrottle.

Autothrottle disconnect occurs automatically:

- if a fault in the active autothrottle mode is detected
- when either reverse thrust lever is raised to reverse idle
- if the thrust levers are overridden during a manual landing, after the autothrottle has begun to retard the thrust levers to idle
- when both engines are shut down

The EICAS caution message AUTOTHROTTLE DISC displays and an aural alert sounds when the autothrottle is manually or automatically disconnected. The EICAS caution message and aural alert are inhibited if the disconnect occurs because of reverse thrust.